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FOREST PRODUCTS LABORATORY

In cooperation with the University of Wisconsin

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TURNING QUALITIES OF SOUTHERN HARDWOODS

By E. M. DAVIS
Associate Wood Technologist

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Tests just made at the Forest Products Laboratory show that good turning qualities are possessed by some of the southern hardwoods that are relatively little known to the trade. Pecan, for example, rated second among 18 southern hardwoods tested. Hackberry and magnolia stood about in the middle of the list. Even cottonwood and willow, which make a poor showing on the average, yield good turnings under certain conditions.

Although the volume of lumber used for turnings is small when compared with many other uses for hardwoods, the value is high because the turned articles, such as handles, sporting goods, woodenware, novelties, and furniture parts, are not cheap goods.

Based on more than 6,000 turnings, the species tested ranked as follows from best to worst: beech, pecan, red gum, hickory, sycamore, yellowpoplar, red oak, white oak, ash, hackberry, magnolia, tupelo, soft maple, black gum, soft elm, basswood, cottonwood, and willow. Three turnings were made from each square, one at 6 percent moisture content, one at 12 percent, and the third at 20 percent.

A speed of 3,300 RPM, which corresponds fairly well to commercial practice, was used in making the turnings. All turnings were of one pattern. The test samples were 3/4 inch by 3/4 inch by 5 inches. They were turned on a modified back-knife lathe, making a more severe test than if an automatic lathe had been used, especially in view of the 3/8 inch minimum diameter of the turnings.

Before beginning the work, the problems involved in the manufacture of commercial turnings were discussed at a number of representative wood turning plants. It was agreed after examining samples, that the test described here, though severe, would offer a satisfactory means of rating the woods for their general "turnability." With suitable machines and by taking sufficient time and trouble, good turnings can be made in almost any wood from balsa to lignum vitae. To produce turnings on a commercial basis, however, requires woods that do not need too much humoring, consequently, a difficult rather than an easy test was selected in order that the differences between species might stand out more plainly.

The type of turning adopted by the Forest Products Laboratory for this test embodies the bead, the cove sharp edges and corners, and straight cuts at different angles with the grain, all of which are features commonly found in turnings. The quality of turnings in a commercial plant is judged by the general smoothness of the surface and by breaks that spoil the detail in the sharp corners and edges. The yardstick is really the amount of sanding that will be required to bring the turnings to an acceptable degree of smoothness for paint, varnish, or other finish.

The turnings in this test were graded on a numerical basis by an experienced woodworker. A rating of five indicated a perfect turning; zero indicated a discard; and one indicated a turning requiring about the maximum of sanding that would be practical. Although several points in each turning were considered and recorded, the poorest point is the most significant because it fixes the quality of the whole piece.

Considering all the 18 woods tested, slightly better results were obtained at 12 percent moisture content than at 6 percent and both 12 and 6 percent gave much better results than did the 20 percent. The woods differed considerably in the degree to which their moisture content affected turning. In white oak, beech, pecan, black gum, hickory, red oak, and red gum, the moisture content of the wood at the time of turning made little difference. Magnolia, sycamore, ash, yellow poplar, cottonwood, and willow were affected the most by moisture content. Good turnings, however, can be made from the last named woods, provided care is taken to keep them at a certain seasoning condition. The following tabulation indicates by species the moisture content at which 85 percent or more of the turnings were of fair or better quality at all points.

Species	Moisture content		
	6 percent	12 percent	20 percent
Ash.....	X	X	
Basswood.....	X		
Beech.....	X	X	X
Cottonwood.....	X		
Elm.....		X	
Gum, black.....		X	
Gum, red.....	X	X	
Hackberry.....		X	
Hickory.....	X	X	
Magnolia.....		X	X
Maple, soft.....	X		
Oak, red.....		X	X
Oak, white.....	X	X	X
Pecan.....	X	X	X
Poplar, yellow...	X	X	
Sycamore.....	X	X	
Tupelo.....	X	X	
Willow.....	X		

Even basswood, cottonwood, and willow, the three poorest turning woods in the list, have one condition under which they produced satisfactory turnings. Beech, white oak, and pecan produced satisfactory turnings at any of the three moisture content values used, and 8 of the 12 remaining woods gave acceptable turnings at two different moisture content values.

The heavy species as a rule turned somewhat better than the light ones. However, there were some exceptions for yellow poplar turned better than several woods that were heavier and soft elm failed to turn as well as several lighter woods. On the average the heavy pieces in any one species turned somewhat better than the light pieces.

In red gum and yellow poplar differences in the turning quality of heartwood and sapwood were apparent, the heartwood turnings being on the average noticeably superior. This is probably a factor of little importance in most woods, either because sapwood and heartwood are about equal in turning qualities, or because the log is largely heartwood as in mature white oak or largely sapwood as in cottonwood.

Turning tests are being continued at the Forest Products Laboratory with other woods and with the same woods from other regions and further announcements of findings may be expected from time to time.

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